SPECTRACOM CORPORATION

ROCHESTER, NEW YORK • USA

MODEL 8140

FREQUENCY DISTRIBUTION AMPLIFIER

INSTRUCTION MANUAL

MP MASTER

MA26539

MODEL 8140

FREQUENCY DISTRIBUTION AMPLIFIER

INSTRUCTION MANUAL

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REVISIONS, IF ANY, ARE LOCATED AT THE END OF THE MANUAL

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WARRANTY

SPECTRACOM CORPORATION warrants to the original purchaser that each new instrument shall be free from defects in material and workmanship for a period of ONE YEAR from date of shipment. Repair or replacement, at our option, will be made when our examination indicates that defects are due to workmanship or materials. Electron tubes, batteries, fuses, and lamps that have given normal service are excluded from warranty coverage. All warranty returns must first be authorized in writing by the factory.

This warranty does not apply to any of our products which have been repaired or altered by persons not authorized by Spectracom Corp. or not in accordance with instructions furnished by us. If the instrument is defective as a result of misuse, improper repair, or abnormal conditions or operations, or if any serial number or seal has been removed or altered, the warranty is void, and repairs will be billed at cost.

This warranty is in lieu of all other obligations or liabilities, express or implied; and Spectracom Corp. neither assumes, nor authorizes any person to assume for them, any other liability in connection with sales of its products.

Repair and Maintenance

Instruments should be returned only upon prior written authorization from Spectracom Corp. or its authorized sales and service representatives. Warranty repair will be made upon written request. Please provide the following information in order to enable us to serve you efficiently:

1. Model number and type
2. Serial Number
3. Description of trouble
4. Operating conditions, and hours of use.

Upon receipt of this information, our service department will send you service data or shipping instructions. Transportation to the factory is to be prepaid by the purchaser.

For assistance, please contact your nearest Spectracom sales representative.

Spectracom Corporation
101 Despatch Drive
East Rochester, NY 14445
(716) 381-4827

WARRANTY REGISTRATION

Dear Customer:

Spectracom occasionally contacts customers regarding our products. We must know to whom we should send manual updates, change notices, and new product information. Because people sometimes change job assignments, we request department, mail station, and title information to ensure that correspondence in future years will reach either the user of our products or his/her supervisor. In filling out the registration, please use the title/mail station/department of the supervisor most interested in keeping the equipment and its documentation up-to-date. Thank you.

We suggest photocopying this page and sending in the copy, so that the form will always be available to you if the information must be changed later.

Name:_____ Title:_____

Department:_____ Mail Stop:_____

Company:_____ Model number: _____

Address:_____ Serial Number:_____

Address:_____ Date Installed: _____, 19____

City:_____ State:_____Zip:_____

Telephone:(_____)_____ Ext.:_____

Remarks: (Problems, suggestions, etc.):

SAFETY NOTES

This manual contains three types of advisory messages:

WARNING

WARNING paragraphs contain information essential for avoiding the possibility of personal harm to the operator or other persons.

CAUTION

CAUTION paragraphs contain information essential for avoiding the possibility of harm to the equipment.

NOTE

NOTE paragraphs contain information which facilitates use or operation of the equipment. Read the information carefully to avoid incorrect or sub-optimal results.

The safety notice

WARNING

Dangerous Voltage

will be shown in alignment or repair procedures whenever the operator or technician risks coming into contact with voltages in excess of 28 Volts.

Note that the commercial power lines represent a lethal source of high current. For this reason, disconnect equipment from the ac power whenever you intend to work on sections of this equipment containing exposed 115/230 V ac wiring.

If the equipment is equipped with a grounded power connector, connect it only to a properly grounded electric outlet. Do not use ungrounded plug adaptors, since under certain conditions, **electric shock** or **equipment damage** can result.

NOTE:

No operator-serviceable parts inside. Refer servicing to qualified technicians only.

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Section 1

Introduction

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OVERVIEW

The **Model 8140 Frequency Distribution Amplifier** receives a standard input frequency and conditions it for distribution to remote points via a coaxial cable distribution network and interface units. The Model 8140 thus provides a precision frequency reference to up to 25 remote locations, eliminating the need for an expensive precision time-base or reference in the remotely located equipment.

10 , 5 , 1 , or 0.1 MHz signals, selectable by pushbuttons on the front panel, are available from the "STANDARD OUTPUT" BNC connector on the front panel. Up to four networks can be connected to BNC connectors on the rear panel, with up to 25 line tap loads distributed among them. The networks are driven by a 10-MHz signal unaffected by the front-panel pushbuttons.

Each remote station is fed by a model 8140 T or 8140 TTL Line Tap interface unit. The Line Tap receives both the distributed RF signal and dc power from the coaxial distribution cable. The RF signal is buffered, divided down to the frequency required by the equipment to be driven, filtered, and made available at the BNC output connector. The TTL version is specially designed to drive TTL loads.

The Line Tap modules are ordered specifically for the desired output frequency, which may be 10, 5.0, 1.0, 0.5, or 0.1 MHz.

If special frequencies, such as 1.544 or 2.048 MHz are required by the customer, the Model 8140 VT VersaTap™ may be used. Contact Customer Service or your Spectracom Sales Representative to discuss these requirements.

The standard-configuration Model 8140 requires an input frequency of 10.0 MHz, but one of three options may be installed to permit other input frequencies as shown in the table below:

Option	Description
07	5-MHz standard input frequency
08	1-MHz standard input frequency
12	100-KHz standard input frequency

These options must be installed at the factory. If you wish to have an existing Model 8140 modified, please contact Customer Service.

EQUIPMENT SUPPLIED

Standard Model

- Model 8140 Frequency Distribution Amplifier
- Instruction Manual
- Power Cord
- Four 50-Ω line terminators
- BNC Connector
- 3/4-Ampere Fuse

Model with Option 01, Rack Mount Kit

- Rack-mount panel extensions.

EQUIPMENT NOT SUPPLIED BUT REQUIRED:

- A precision frequency source. The following SPECTRACOM units may be used:
  - § Model 8161 Standard Frequency Receiver Oscillator
  - § Model 8164 NBS Receiver - Disciplined Oscillator
  - § Model 8130 Frequency Standard Oscillator.
- Model 8140 T, 8140 TTL, or 8140 VT line tap modules, as required by your system design.
- Sufficient RG58 coaxial cable for the distribution network.
- Cable and connectors to connect the Model 8140 to the precision frequency source.

AVAILABLE OPTIONS:

Option	Description
01*	Rack Mount Kit
07	5-MHz standard input frequency
08	1-MHz standard input frequency
12	100-KHz standard input frequency
20	Audible alarm

* Can be installed in the field by the customer.

SPECIFICATIONS

MODEL 8140 INPUTS & OUTPUTS

Front Panel Output: 0.1, 1.0, 5.0, or 10 MHz, selectable from the front panel. TTL compatible (fanout: 2 maximum) 3.4-V rectangular positive pulses. Drives 93-Ω or greater resistive load or cable.

Rear Panel Outputs: Four BNC connectors, all providing a 10-MHz sine-wave signal to terminated and dc-isolated cable via separate buffer amplifiers. Level is 0.5 V rms, 50 Ω, with superimposed +12 V dc to power the Line Tap modules.

Rear Panel Input: BNC connector, 50 Ω. Signal level 0.25 to 3.0 V rms. Frequency normally 10 MHz, with alternate 5.0, 1.0, or 0.1 MHz furnished as Options 07, 08, or 12.

Fault Indication: Output Fault Lamp gives automatic indication of loss of signal at any output connector. Audible Alarm is available as Option 20.

LINE TAPS

Input: Buffered high impedance causes negligible mismatch on main trunk line distribution cable. Accepts signal levels provided by the base station (Model 8140) rear panel outputs.

Output Level: Standard unit (Model 8140T) provides 600 mV rms sine wave into 50 Ω. When used without termination, output is TTL compatible. Optional unit (Model 8140TTL) provides TTL 3.4 V rectangular positive pulses from a 50-Ω source.

Output Frequencies: 10, 5.0, 1.0, 0.5, or 0.1 MHz. Specify frequency for each Line Tap ordered.

Harmonic Distortion of Output: –40 dB for standard unit with sine-wave output.

Crosstalk (Isolation): 80 dB minimum.

Output Phase Noise: Typically less than –130 dB/Hz 1 KHz from carrier for 10 MHz input to base station amplifier.

Line Tap Size (L x W x H): 5.25 x 2.63 x 1.71 inches (133 x 67 x 43 mm). Mounting hole pattern: 4.75 x 1.75 inches (121 x 44 mm).

VERSATAP

Description: The VersaTap™ is a single-frequency synthesizer, the output of which is factory-set to any frequency between 1 KHz and 16 MHz in 1-KHz increments, or between 16 and 20 MHz in 2-KHz increments. Special frequencies can be furnished, such as the 3.5795454...MHz. TV color subcarrier. Exact frequencies must be specified at time of order.

Input: Buffered high-impedance input. Accepts 10.0 MHz with signal level between 100 millivolts and 5.5 volts peak-to-peak on a dc voltage of 7 to 12 Vdc. the dc current requirement is 110 milliamps at +12 Vdc.

Output A: A sine wave of 1.7 volts peak-to-peak at the specified frequency into a 50-Ω load for frequencies greater than 100 KHz. A TTL output for frequencies below 100 KHz with a source impedance of 50 Ω (SN74S140 driver).

Output B: A TTL output at the specified frequency with a source impedance of 50 Ω (SN74S140 driver). If the internal jumper W6 is moved to location W5, output B is *high* when the VersaTap is phase locked to the incoming reference and *low* when it is unlocked.

Lock LED: The LED will light when the VersaTap is locked to the incoming reference. If the dc input is low, which may cause the VersaTap to malfunction, the LED will blink. The LED will be unlit when the VersaTap is not locked to the incoming reference.

Dimensions (L x W x H): 8.3 x 4.2 x 1.7 inches (211 x 107 x 43 mm). Mounting hole pattern: 8.88 x 2.75 inches (225.4 x 69.9 mm).

TRUNK LINE LOADING LIMITATIONS

Number of Remote Stations: 25 Line Tap loads maximum, total on all 4 outputs. One VersaTap™ = 3 Line Tap Loads.

Distance to Remote Stations: Up to 25 Line Taps on one output at an average distance of 750 feet (228 m). 1500 feet (457 m) maximum using RG-58 cable. Model 8140TA Distribution Line Amplifier ("Line Extender") extends this distance to up to 3000 feet (915 m), with fewer Line Taps allowed. Use of RG-8 cable extends the distance to 3000 feet (915 m) with all 25 Line Tap loads allowed.

ENVIRONMENTAL SPECIFICATIONS

Ambient Air Temperature: 0 – 50°C.

Unpacking and Initial Setup

Unpacking 2.2

Equipment Placement and Mounting 2.2

Equipment Setup 2.3

Unpacking

Do the following steps to unpack the Model 8140 Frequency Distribution Amplifier:

[1] Upon receipt, open the shipping carton and carefully remove all contents.

[2] Check each item against the packing list.

NOTE

If any items are missing, immediately notify the Customer Service department.

[3] Check that there is no apparent damage to any item.

NOTE

Each item has been carefully checked and packed before shipment. If the external packing appears damaged by rough handling, note this fact on the carrier's shipping receipt. If any item appears damaged, notify the shipping carrier immediately and file a claim. *Be certain* to save all packing materials, as they may be required for inspection by the carrier.

If any item must be returned to Spectracom, contact Customer Service for a return authorization number first.

Equipment Placement and Mounting

The Model 8140 Frequency Distribution Amplifier may be installed in a standard 19-inch equipment rack if Option 01, Rack Mount Kit, is installed.
5-1/4 inches of vertical rack space is required. Depth required is 13.5 inches (34.3 cm), plus 2 – 3 inches (5.1 – 7.6 cm) rear clearance for cables.

Otherwise, the Model 8140 may be placed on a bench or shelf. Depth required is 13.5 inches (34.3 cm), plus 2 – 3 inches (5.1 – 7.6 cm) rear clearance for cables. Width: 8.5 inches (21.6 cm). Height: 5.25 inches (13.33 cm).

Allow at least 1 inch (2.54 cm) clearance on the top surface to provide adequate ventilation.

Unless Option 20, Audible Alarm, has been installed, the Model 8140 should be mounted so that the operator can see the "OUTPUT FAULT" lamp on the front panel.

Equipment Setup

CAUTION

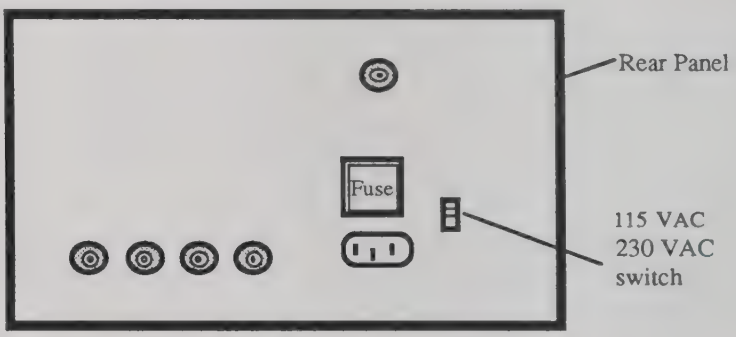
Do the following steps *before* connecting the Model 8140 to the ac power:

[1] Move the "115 VAC/230 VAC" switch on the rear panel to the correct position for the line voltage to be used.

[2] Check that the correct value of fuse, corresponding to the line voltage selected, is installed.

NOTE

See the label on the rear panel for the correct fuse to be used.

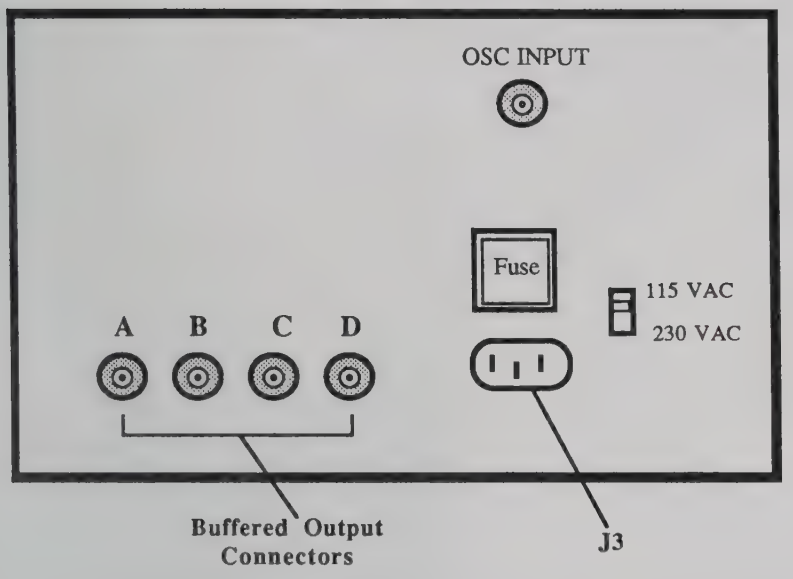


The standard input frequency for the Model 8140 is 10 MHz. Other input frequencies may be used if the correct option is installed. See the table below for the allowable frequencies and the required option for each:

Option	Description
07	5-MHz standard input frequency
08	1-MHz standard input frequency
12	100-KHz standard input frequency

These options must be installed at the factory. Contact Customer Service if you wish to have your Model 8140 modified to use one of these alternative standard input frequencies.

Model 8140
Rear Panel



[3] Bring the coaxial cables of the distribution network(s) to the buffered output connectors, but do not connect them yet. See the "Interconnections" section for help in designing the distribution networks.

[4] Connect the power cord to J3.

[5] Connect the other end of the power cord to a grounded ac outlet supplying the line voltage selected in step 4.

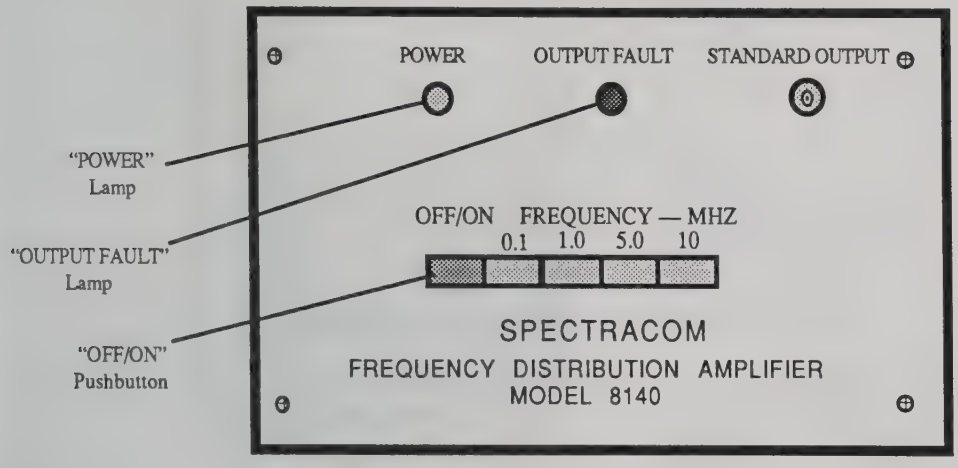
[6] Do the "Initial Checkout" procedure.

Initial Check Procedure

INITIAL CHECK PROCEDURE

Do the following steps to perform the initial check of the Model 8140 Frequency Distribution Amplifier:

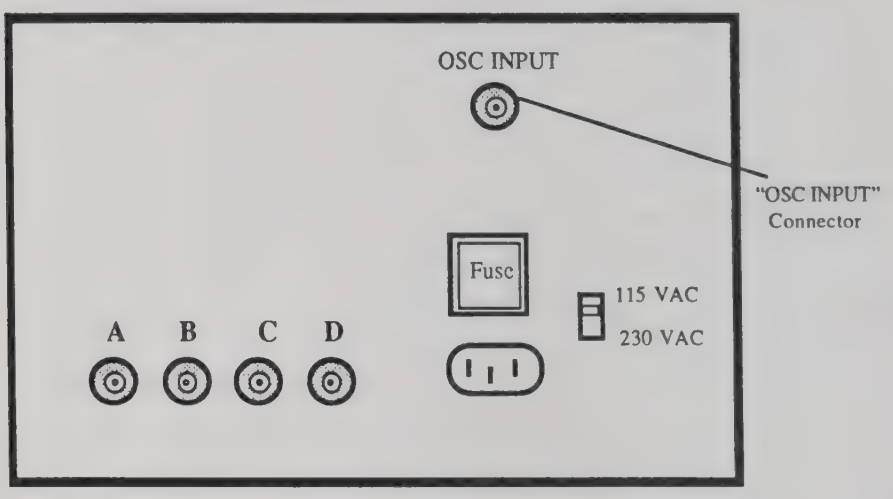
Model 8140
Front Panel



[1] Press the red "OFF/ON" pushbutton in.

[2] Check that:
- the "POWER" lamp illuminates
- the "OUTPUT FAULT" lamp illuminates
- the audible alarm operates (if option 20 is installed).

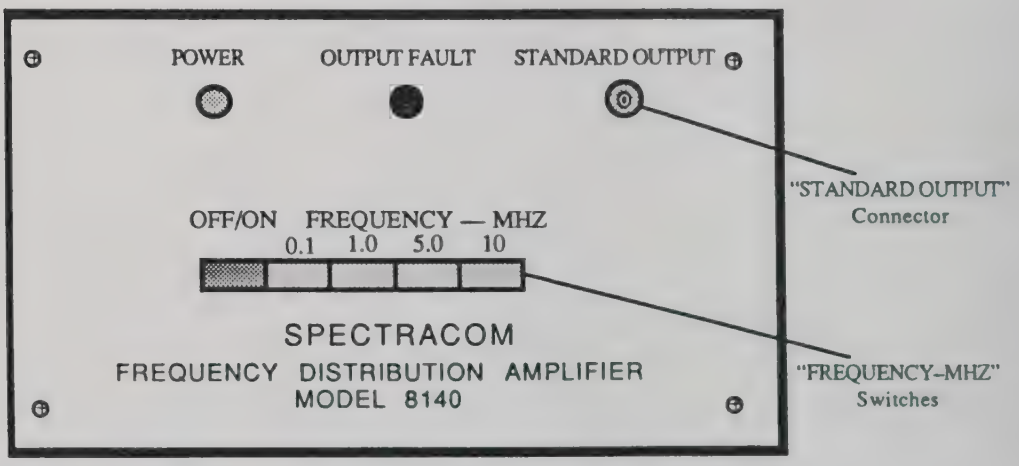
Model 8140
Rear Panel



[3] Connect the standard input frequency source to the "OSC INPUT" connector on the rear panel.

[4] Check that:
- the "OUTPUT FAULT" lamp extinguishes
- the audible alarm is silenced (if option 20 is installed).

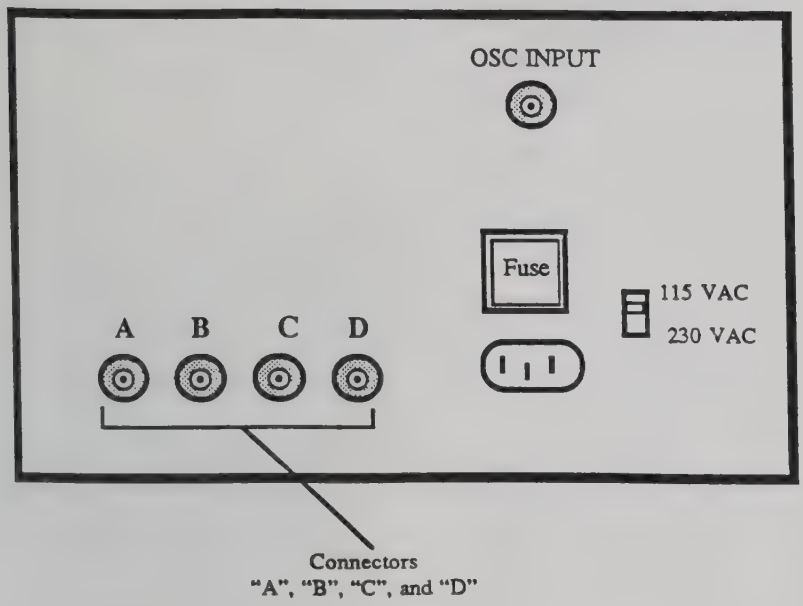
Model 8140
Front Panel



[5] Connect an oscilloscope to the "STANDARD OUTPUT" connector on the front panel.

[6] Press each of the "FREQUENCY – MHZ" switches, one at a time, and check that:
- a TTL square-wave signal is present
- the frequency changes appropriately.

Model 8140
Rear Panel



[7] Connect the oscilloscope to the "A" connector.

[8] Check that a sine-wave signal of 0.5 V rms, superimposed on 12 V dc, is present.

[9] Repeat steps 7 and 8 for connectors "B" – "D".

[10] Disconnect the oscilloscope.

[11] Short the center conductor to ground on the "A", "B", "C", and "D" connectors, one at a time, and check that:
- the "OUTPUT FAULT" lamp illuminates
- the audible alarm operates (if option 20 is installed).

[12] Connect the coaxial cables of the distribution network(s) to the buffered output connectors "A", "B", "C", and "D". After each connection, check that the "OUTPUT FAULT" lamp does not light.

NOTE

If the "OUTPUT FAULT" lamp lights after any connection to the buffered output connectors, check the cable just connected for shorts or improper loads. The end of the cable should be terminated by a dc-isolated 50-Ω terminator (P/N 004490).

System Interconnection

Components 4.2

Design of Distribution Networks 4.3

Special Considerations When using the Model 8140VT VersaTap™ 4.3

Determining the Number of Line Tap Loads Versus Cable Type and Length 4.4

Typical Interconnection Diagram 4.5

SYSTEM INTERCONNECTION

When designing a system to distribute a standard frequency signal to remote locations, observe the following considerations:

COMPONENTS

A Frequency Distribution System may use any of the following components:

Model 8140 Frequency Distribution Amplifier. This is a device designed to amplify and send a standard signal to a distribution network.

Model 8140 T and Model 8140 TTL Line Taps. These devices, powered by dc on the coaxial feedline, are attached to the coaxial distribution network and provide an output at one of 3 specified frequencies; 1, 5, or 10 MHz. The frequencies of 500 and 100 KHz are available at somewhat higher cost.

The Model 8140 T provides a filtered sine-wave output at 600 mV into a 50–Ω load. This signal can drive a TTL load with a fanout of 2 if the line is unterminated and short.

The Model 8140 TTL is optimized for driving TTL 50 Ω loads.

Each Line Tap bears a label showing its output frequency. Should this label be lost, the frequency can easily be determined using a frequency counter or oscilloscope.

Model 8140TA Line Extender Amplifier. The Line Extender Amplifer must be used to boost the output signal when the coaxial distribution network is more than 1500 feet (457 m) long. The Line Extender will drive an additional 1500 feet (457 m) of RG58 coaxial cable with Model 8140 Line Taps installed along its length.

Two dc-isolated 50 Ω terminators must be used; one at the input tee connector of the Line Extender Amplifier and one at the far end of the cable connected to the output of the Line Extender Amplifer.

See the "Typical Interconnection Diagram" at the end of this section for an approved method of interconnection.

DESIGN OF DISTRIBUTION NETWORKS

Four buffered outputs, labeled "A". "B", "C", and "D", are provided on the rear panel of the base station so that trunk lines may be run in each of four directions from the base station. This minimizes the total length of coaxial cable in the system. In planning the system installation, follow these basic rules:

1. No more than 25 Line Taps may be driven from one base station under any circumstances, or the power supply capacity will be exceeded.

2. Using RG-58 cable, 1500 feet (457 m) is the longest trunk line that may be used. If longer runs are required, you may:

   A. locate the Model 8140 in the geographical center of the installation, running distribution lines in both directions and achieving a coverage of 3000 linear feet (914 m);

   B. use a Model 8140TA Line Extender Amplifier at 1500 feet, allowing a further 1500-foot (457-m) extension of the distribution line. The Model 8140TA counts as one Line Tap towards the total number allowed.
   Use a Distribution Line Termination, part number 004490, at the input tee connector and at the end of the extended line section, as shown in the "Typical Interconnection Diagram".

3. Each distribution line must be terminated with a Distribution Line Termination. Four of these are included in the Ancillary Kit furnished with the equipment.

4. If 25 Line Taps are used, their average distance from the amplifier is limited to 750 feet (228 m), using RG-58. Up to 12 Line Taps may be placed at 1500 feet (457 m) on any one trunk line.

We recommend that, wherever practical, the Line Taps be permanently mounted to a lab bench or wall nearby. This avoids their loss or misplacement and discourages people from occasionally disconnecting them, thus cutting off the signal to stations further down the line.

SPECIAL CONSIDERATIONS WHEN USING THE MODEL 8140VT VersaTap™

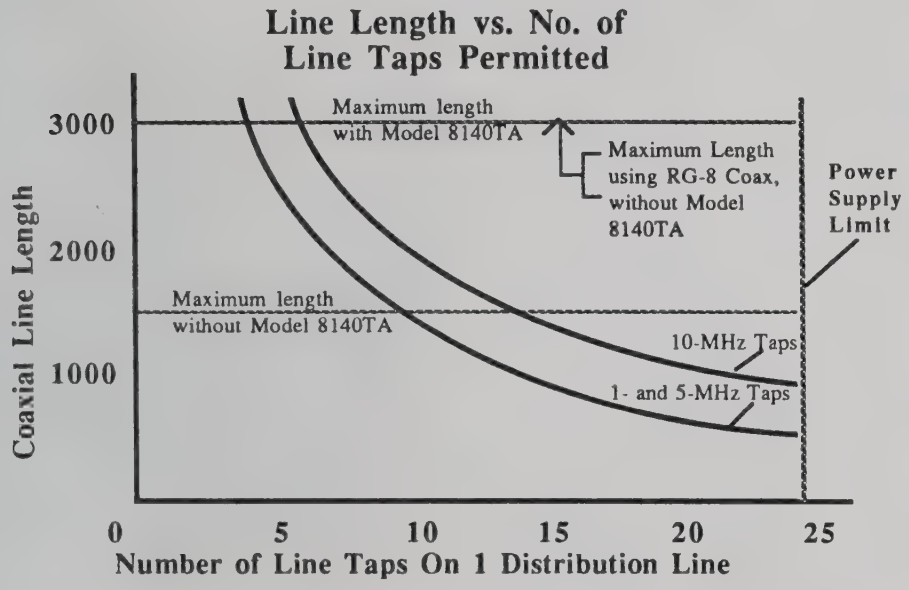
The Model 8140VT VersaTap™ is used in lieu of a standard Line Tap when a special frequency output, such as 1.544 or 2.048 MHz, is required by the remote station equipment.

See the VersaTap Instruction Manual for details of installation and operation.

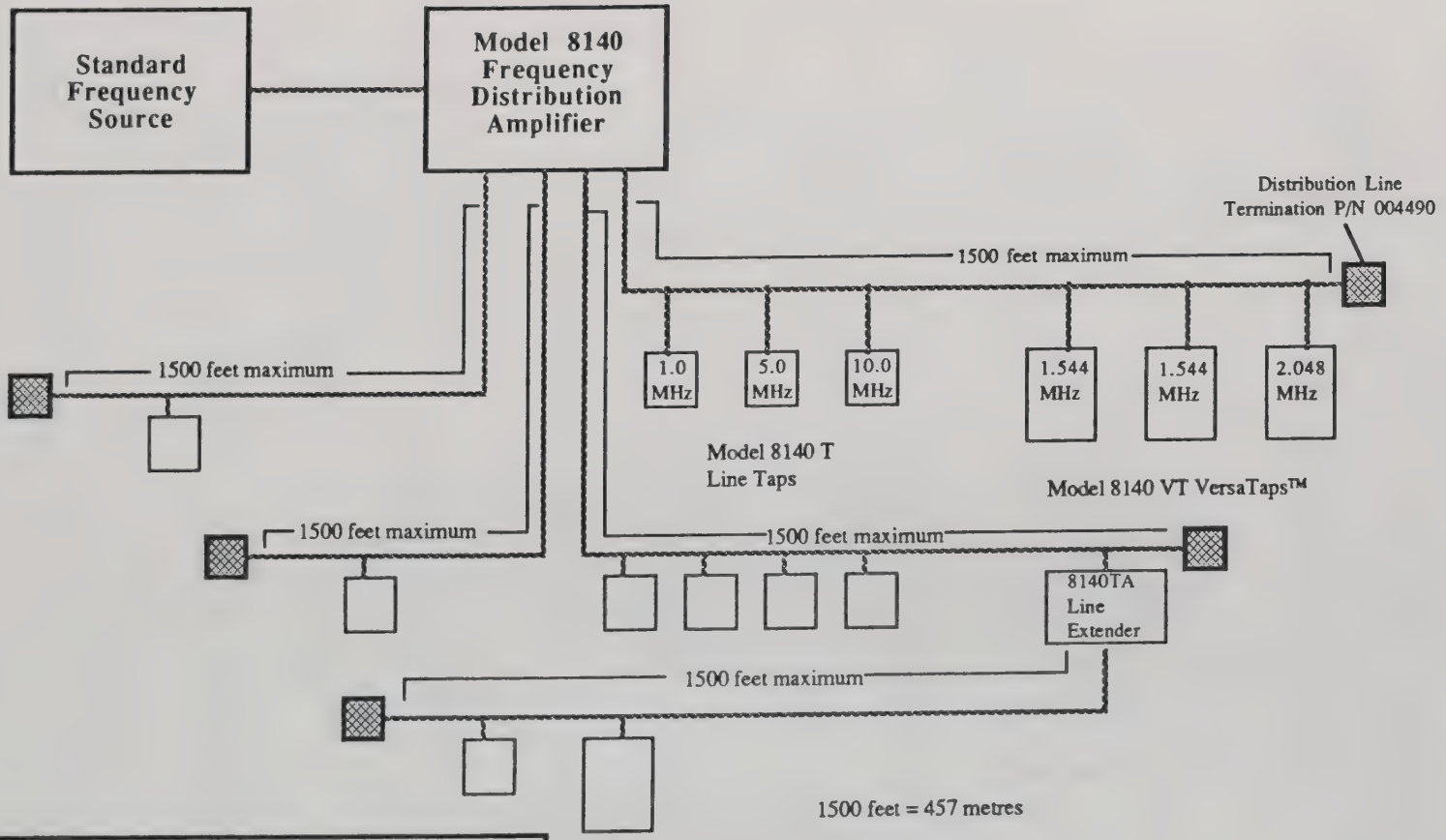
Each VersaTap consumes the dc power of 3 Line Taps; the total number of Line Taps allowed is correspondingly reduced.

DETERMINING THE NUMBER OF LINE TAP LOADS VERSUS CABLE TYPE AND LENGTH

See the graph below to approximately determine the number of permissible line taps as a function of cable type used and distribution line distance.



Typical Interconnection Diagram



NOTES:

1. A Model 8140T or TTL Line tap = 1 load.
   A Model 8140VT = 3 loads.
2. A maximum of 25 loads may be connected to a Model 8140 Frequency Distribution Amplifier.
3. For coaxial cable runs of over 1500 feet [457 metres], a Model 8140 TA Line Extender must be used as shown.

Operation

Front Panel Controls 5.2

Rear Panel Controls 5.2

Using the Line Taps 5.3

Repairs 5.4

OPERATION

FRONT PANEL CONTROLS

OFF/ON (Power)

Depressing this button applies ac power to the unit. The green "POWER" lamp illuminates.

FREQUENCY -MHZ

These four buttons choose one of four frequencies available at the "STANDARD OUTPUT" connector on the front panel. The frequencies are 0.1, 1.0, 5.0, and 10.0 MHz. Each button is labeled with the frequency it provides. The buttons do not affect the frequencies available at connectors "A", "B", "C", or "D" on the rear panel, nor the output frequencies of any line taps.

STANDARD OUTPUT

This BNC connector provides an output signal derived from the standard input signal applied to the rear panel "OSC INPUT" connector. The output is TTL compatible, with maximum fanout of 2, and may also be used to drive a resistive load or cable of 93 Ω or greater.

OUTPUT FAULT LAMP

This red lamp illuminates when a loss of signal occurs at any rear panel output connector, or the driving signal at the "OSC INPUT" connector is lost. On units accepting input frequencies other than 10 MHz (Option 07, 08, or 12 installed), this lamp will light if the input translator circuit does not acquire phase lock to the input signal.

REAR PANEL CONTROLS

OSC INPUT

This BNC connector is the input port for the distribution amplifier. The input impedance is 56 Ω. The input frequency must be 10 MHz unless one of the options below has been installed:

Option	Description
07	5-MHz standard input frequency
08	1-MHz standard input frequency
12	100-KHz standard input frequency

CONNECTORS "A", "B", "C", & "D"

These BNC outputs drive the trunk coaxial lines of the distribution system. All four provide 10 MHz, each from a separate line driver, and each with 12 V dc across the coaxial line to power the line taps. The maximum number of line taps (25 at 750 feet) may be driven from one of these outputs, or they may be split up between the four outputs in any combination. Up to 12 line taps may be driven from any one single output at 1500 feet from the Model 8140. No more than 25 line taps total may be driven from one base station Model 8140.

CAUTION

The rear panel buffered line outputs "A", "B", "C", and "D" may be used to drive *only* SPECTRACOM Line Taps. After the last Line Tap on each trunk line, a dc-isolated 50-Ω load (Part Number 004490) must be connected to correctly terminate the line.

USING THE LINE TAPS

The Line Tap will supply 600 mV rms into 50 Ω. Although this signal is a filtered sine wave, it may be used to drive TTL loads if the line is not terminated and is not overly long. Standard Line Taps are available at any one of four frequencies, as shown in the table below:

Line Tap Output Frequencies

Model Number	Output Frequency
8140T10	10 MHz
8140T5	5.0 MHz
8140T1	1.0 MHz
8140TR5	0.5 MHz
8140TR1	0.1 MHz

If more than one of these frequencies are needed at a test station, mount the Line Taps for the desired frequencies next to each other and run the distribution line through each of the input tee connectors in turn.

REPAIRS

Should a Line Tap malfunction, contact Customer Service about our repair/exchange program. The Line Taps are sealed assemblies and are not field-repairable.

Principles of Operation

Distribution Amplifier, A4 ..... 6.2

Power Supply, A1 ..... 6.2

Input Translator Board, A3
(Options 07, 08, or 12) 6.3

Audible Alarm, A2 (Option 20) 6.3

Model 8140T Line Tap Modules 6.3

Model 8140VT VersaTap Modules 6.4

PRINCIPLES OF OPERATION

Refer to the assembly drawings and schematic diagrams in the "Diagrams" section as you read the following description.

Distribution Amplifier A4

The signal from the external standard frequency source (or from the A3 Input Translator Board, if option 07, 08, or 12 is installed), is fed to the 10 MHz standard input of the A4 Output Amplifier Assembly at J1 pin 10, where it is buffered and amplified by Q1 and Q2. From there, the signal goes through gates U1A and U1B, where it is sent through gates U4C and U8A, filtered by L1, L2, and C17, and delivered directly to the rear panel output BNC connector.

The drive levels from the rear panel outputs are sinusoidal at 3.0 volts peak-to-peak. If the outputs are terminated with 50 ohms, the output wave shape is still sinusoidal but at a reduced voltage level, approximately 0.5 V rms.

The presence of output signal at each of these rear panel jacks is detected by a diode capacitor combination at each output jack and used as a signal for front-panel indication of output fault. If the rear panel output at any one of these four jacks is not present, the red "OUTPUT FAULT" lamp is lit. Detector outputs at all four jacks are gated together through diodes CR5, CR9, CR13, and CR17 and fed to a transistor switch consisting of Q5, Q4, and Q3, which lights the output fault lamp in the absence of output signal.

The output signals as they are divided are fed to gates U4, U3, and U2 and are selectively fed to the front-panel "STANDARD OUTPUT" jack according to the frequency selector push button settings.

Power Supply A1

The ac power is conducted through J3 on the rear panel, through F1, and the voltage selection switch S2 to the dual primaries of transformer T1. A diode bridge on circuit board A1 connected to the secondary of T1 delivers full-wave rectified unregulated 18 V dc to the separately mounted filter capacitor C3. From there, the dc is fed to the Distribution Amplifier board A4.

The ac is fed from the center tap of transformer T1 to A1J1-7. U1, a 7805 voltage regulator, provides a regulated 5 V dc output on connector A1J1-4, 5, and 6.

Input Translator Board A3 (Options 07, 08, and 12)

The input translator board A3 contains a 10-MHz crystal-controlled phase-lock loop. It is phase locked to the incoming standard frequency reference. For Option 07, the input frequency is 5 MHz. For option 08, the input frequency is 1 MHz; for option 12, the input frequency is 100 KHz.

The input signal is applied via J1-3 to the differential amplifier, comprising Q1, Q2, and Q3. The signal is amplified and squared by U1 and fed into U2, the phase-locked-loop circuit. The outputs from U2 are fed to the frequency error amplifier U3. The output of U3 is fed to a low-pass filter consisting of R20 and C11. This dc error signal controls the voltage on the Varicap C13, which in turn controls the frequency of crystal Y1. The VCXO (voltage controlled crystal oscillator) includes Q5 and feedback capacitors C17 and C18. The output from the VCXO is fed to U1 and divider chain U4, U5. Appropriate jumpers determine the divide ratio of the feedback signal to the phase-locked loop circuit U2. The divide ratios are 2, 10, or 100 for options 07, 08, 12, respectively. The output signal from the translator appears on A3J1-7. This signal is fed to the distribution amplifier board A4 via connector A4J1-10.

A loss-of-lock signal is provided on A3J1-10. This signal is low when the translator phase-locked loop is not locked to the incoming reference. This will cause the "OUTPUT FAULT" lamp on the front panel to be illuminated.

Audible Alarm A2 (Option 20)

The audible alarm will operate when there is a loss of signal at any rear-panel output connector or if there is no input signal present at the "OSC INPUT" connector. On units accepting input frequencies other than 10 MHz (option 07, 08, or 12 installed), the alarm will operate if the input translator does not acquire phase lock to the input signal. Potentiometer R3 controls the volume level.

Model 8140T Line Tap Modules

The output frequency from each Line Tap is derived directly from the 10 MHz distribution line signal from the Model 8140 base station. The Line tap samples the trunk line signal with a high impedance buffer stage which does not load down the 50 Ω line impedance. The signal is then amplified, and divided in frequency if other than 10 MHz is required, then refiltered and fed to the output connector as a 600 mV rms signal at 50 Ω. If the output is not terminated, it will drive TTL loads with a maximum fanout of 2.

Model 8140VT VersaTap™ Modules

The VersaTap is a single-frequency synthesizer whose output is factory-set to any frequency between 1 KHz and 16 MHz in 1 KHz increments, and between 16 and 20 MHz in 2-KHz increments. Some other frequencies can be provided on special order. The VersaTap accepts 10 MHz signal from the Model 8140. A VCXO (voltage-controlled crystal oscillator) and a phase-locked loop are followed by a divider chain synthesizing the desired frequency.

Diagnostics

General 7.2

Diagnostic List 7.2

Alignment / Check Procedures 7.4

A3 Input Translator Board 7.4

A2 Audible Alarm 7.5

Model 8140T Line Tap Module 7.5

DIAGNOSTICS

General

In case of difficulty:

I. Refer to the Diagnostic List below, and perform the indicated checks.
II. Perform the alignment procedures which seem to relate to any unresolved symptoms.
III. Contact Customer Service for additional help, if necessary.
IV. If the unit must be returned to the factory, please contact Customer Service for a return authorization number and further instructions.

Diagnostic List

If you observe these symptoms	Do these checks:
A. No operation. "Power Lamp"does not illuminate.	1, 2, 3
B. "POWER" lamp lights, "OUTPUT FAULT" lamp is lit.	4, 5
C. "OUTPUT FAULT" lamp not lit, yet no output from any Line Tap. Signal available at the "STANDARD OUTPUT" connector.	6
D. "OUTPUT FAULT" lamp not lit; no signal at one remote location; others OK.	7
E. "OUTPUT FAULT" lamp not lit, yet no output from any Line Tap. Signal *not* available at the "STANDARD OUTPUT" connector.	10

Checks

1. Check that the unit is plugged into the correct ac power.
2. Remove and check the fuse for correct type and electrical continuity. Replace the fuse with the correct type if it is faulty.
3. Check that the "115 VAC/230 VAC" switch on the rear panel is in the correct position for the line voltage used.

4. Check that the signal source is supplying a signal of the correct frequency and amplitude to the "OSC INPUT" connector.

Option	Correct Input Frequency
None	10-MHz standard input frequency
07	5-MHz standard input frequency
08	1-MHz standard input frequency
12	100-KHz standard input frequency

5. Disconnect the distribution coax lines, one at a time, from connectors "A", "B", "C", and "D" while observing the "OUTPUT FAULT" lamp. If the lamp extinguishes when a distribution line is disconnected, check that part of the network for shorts or improper loads.
6. Disconnect the distribution coax lines from connectors "A", "B", "C", and "D". Using an oscilloscope, check that a 10-MHz signal, superimposed on +12 V dc, is present. If no +12 V dc, do checks 8 and 9.
7. Replace the Line Tap module at that location with another known to be good. If the signal is restored to that location, return the Line Tap to the factory for exchange.
8. Remove the cover. Check that pin A4J2-4 has +12 V dc. ± 1 V with reference to pin A4J2-1. If not, check U10 on the A4 Distribution Output Amplifier.
9. Remove the cover. Check that pin A4J2-2 has +22 V dc. ± 3 V with reference to pin A4J2-1. If not, check the Power Supply A1.
10. Remove the cover. Check that pin A4J2-3 has +5 V dc. ± 1 V with reference to A4J2-1. If not, check U1 on the Power Supply A1.

If none of these checks leads to discovery of the fault, a more serious difficulty exists, most likely located in the Distribution Output Amplifier circuit board A4.

If Option 07, 08, or 12 is installed, check that a 10 MHz signal is available at pin A4J1-10 with a correct drive signal at the "OSC INPUT" connector. If no 10 MHz signal is present, the fault may lie in the A3 Input Translator circuit board.

ALIGNMENT/CHECK PROCEDURES

CAUTION

The following procedures should be done only by a qualified electronics technician and only if improper operation is suspected.

Input Translator Board A3

Equipment Required
Digital or Analog Voltmeter, 20,000 Ω/V minimum impedance

Procedure
Do the following steps to align the Input Translator, if option 07, 08, or 12 is installed:

[1] Remove the top cover.

[2] Connect the reference signal to the "OSC INPUT" connector. The signal should be that shown in the table below:

Option	Correct Input Frequency
07	5-MHz standard input frequency
08	1-MHz standard input frequency
12	100-KHz standard input frequency

[3] Using the voltmeter, check the dc voltage at the brown test point on the Input Translator Board A3.

Voltmeter	
+	−
Brown Test Point	ground
+5 to +7 Vdc	

[4] If the voltage is not between +5 and +7 V dc, adjust the trimmer capacitor C15 until the voltage is centered between the two values.

NOTE

This adjustment compensates for the aging characteristics of the crystal and may be required every 3 – 4 years.

[5] Install the top cover.

Audible Alarm A2 (Option 20)

Equipment Required

None.

Procedure

Do the following steps to adjust the volume of the Audible Alarm, if option 20 is installed:

[1] Remove the top cover.

[2] Disconnect the reference signal from the "OSC INPUT" connector.

NOTE

This simulates the loss of the input signal. The audible alarm should operate.

[3] Using a small, flat-blade screwdriver, adjust potentiometer R3 on the Audible Alarm circuit board A2 until the volume is correct.

[4] Install the top cover.

Model 8140 Line Tap

Equipment Required

Oscilloscope, 60 MHz bandwidth
10:1 oscilloscope probe

Procedure

Do the following steps to check the Model 8140 Line Tap module:

[1] Connect a coaxial BNC tee connector to the output of the line tap module under test.

[2] Connect a 50 ohm termination load to one end of the tee connector.

[3] Set the oscilloscope for:
DC coupling
1 cycle/cm sweep.

[4] Connect the oscilloscope to the other end of the tee connector.

NOTE

Use a 10:1 attenuating oscilloscope probe if the expected output frequency from the line tap module is 5 or 10 MHz.

[5] Check the signal voltage from the line tap module.

NOTE

The signal should be a sine wave 1.4 V peak-to-peak minimum, 2.0 V peak-to-peak typical, symmetrically about the 0-voltage reference.

[6] Disconnect the 50 Ω termination load.

[7] Check the signal voltage from the line tap module.

NOTE

The signal should be a sine wave 3.0 V peak-to-peak minimum, 4.0 V peak-to-peak typical, with a dc offset such that the negative peaks almost touch the 0-volt reference.

Diagrams

Introduction 8.2

Mainframe Assembly Drawing 8.3

Mainframe Schematic Diagram 8.4

A1 Power Supply Assembly Drawing 8.5

A1 Power Supply Schematic Diagram 8.5

A2 Audible Alarm (Option 20)
Assembly Drawing 8.6

A2 Audible Alarm (Option 20)
Schematic Diagram 8.6

A3 Input Translator (Option 07, 08, 12)
Assembly Drawing 8.7

A3 Input Translator (Option 07, 08, 12)
Schematic Diagram 8.8

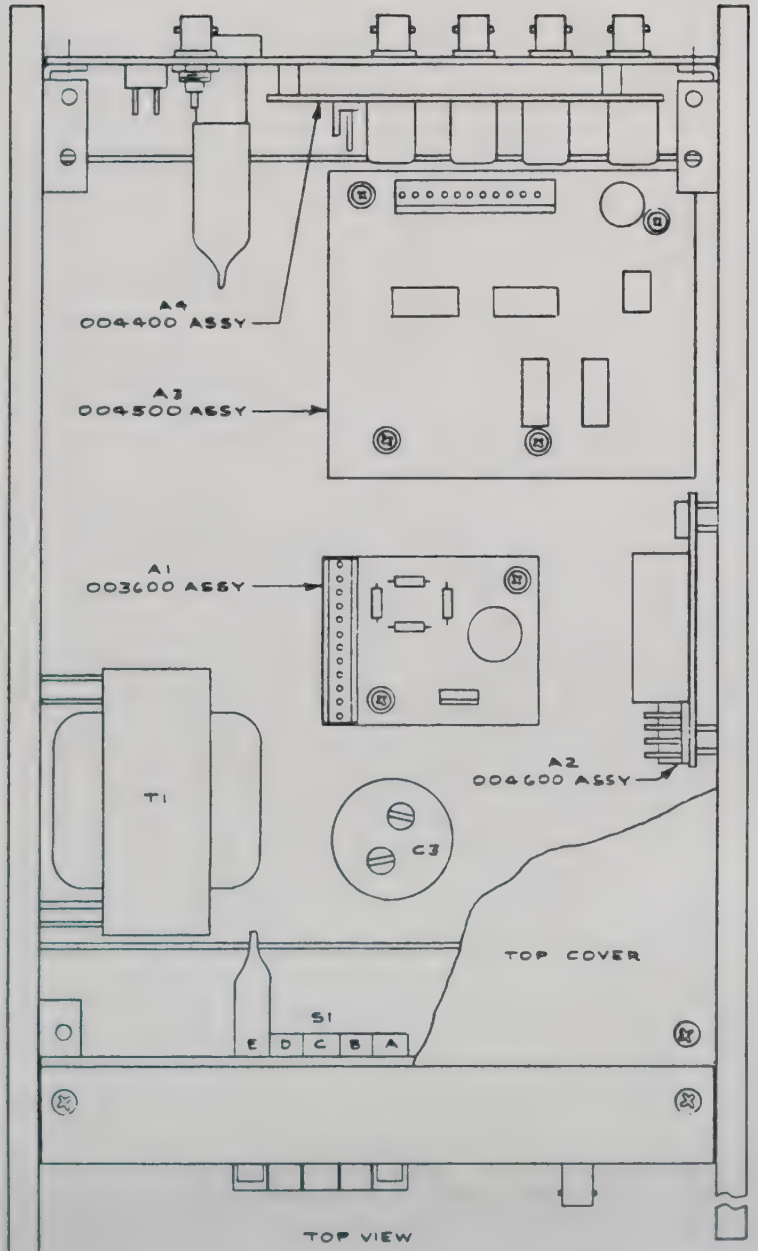
A4 Distribution Amplifier
Assembly Drawing 8.9

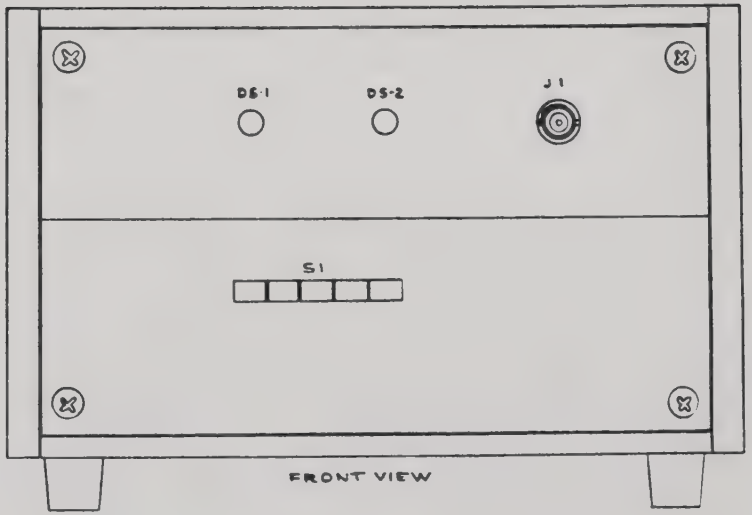
A4 Distribution Amplifier
Schematic Diagram 8.10

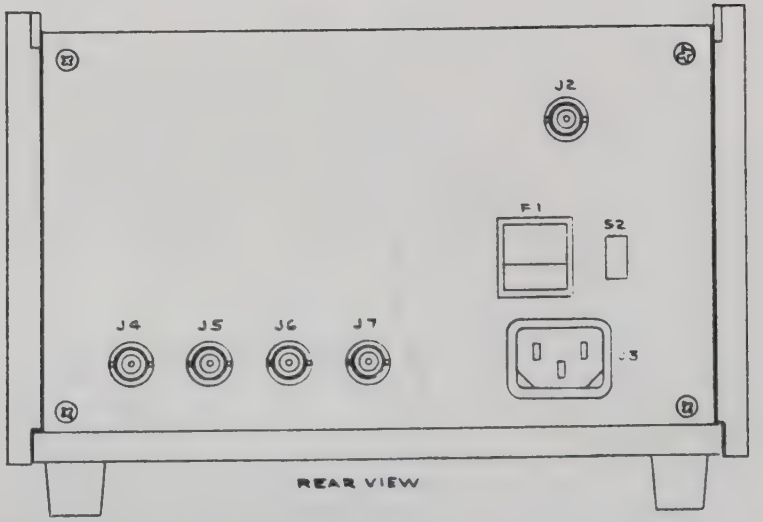
DRAWINGS AND DIAGRAMS

Introduction

The assembly drawings and schematics, provided in this section as an aid to trouble-shooting, include those for optional assemblies. If the unit you have does not have option 07, 08, or 12 (Input Translator Board A3), then "OSC INPUT" J2 will be connected directly to the Distribution Amplifier A4 at P4-10 and P4-11. The mainframe harness is not provided with option connectors if the option is not implemented.

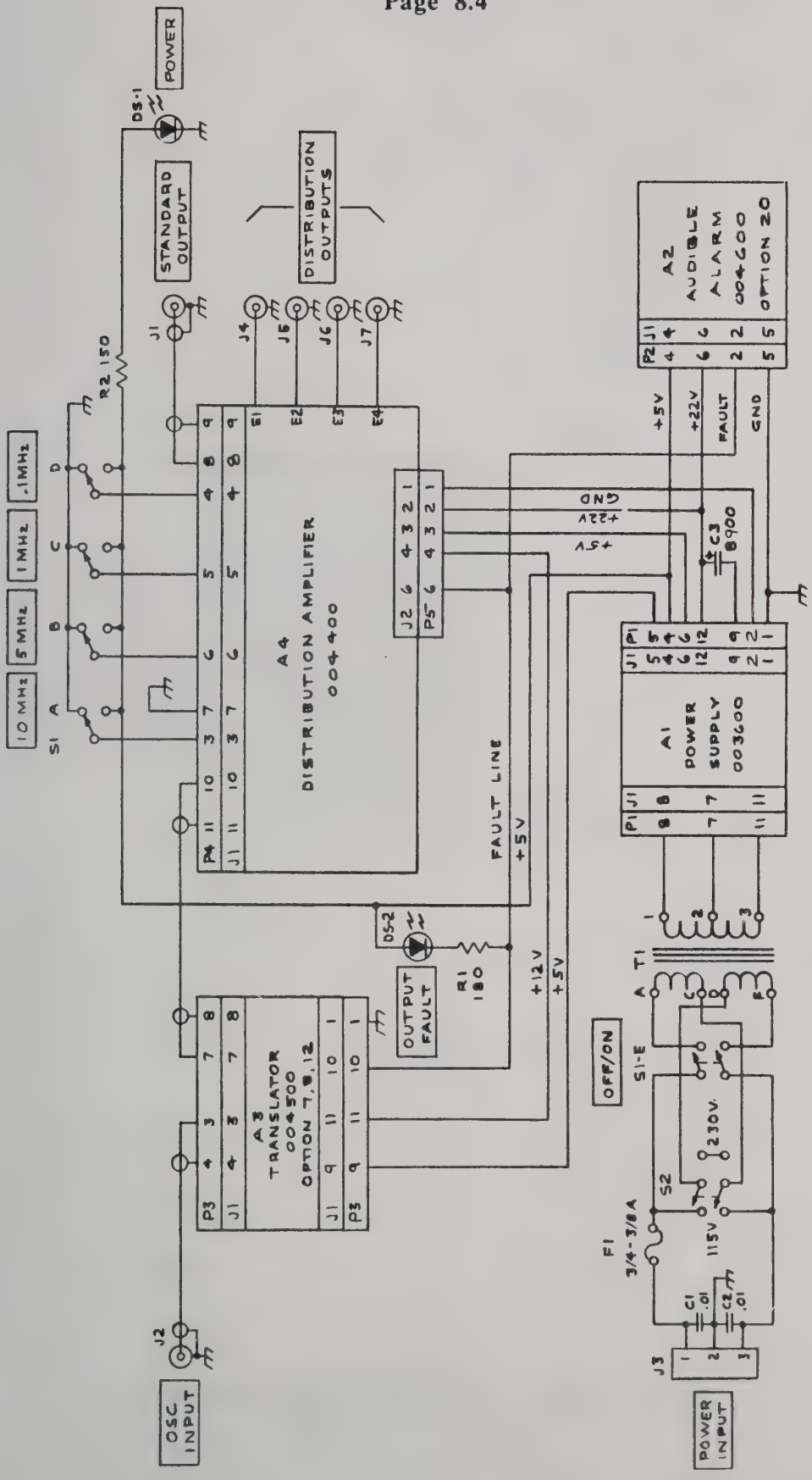




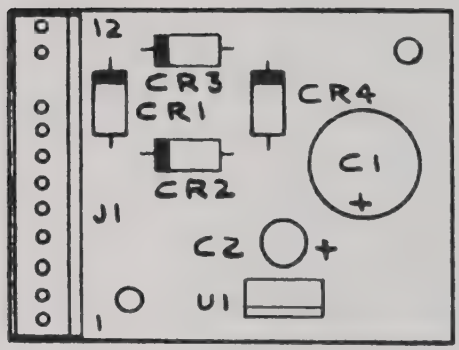


NOTE: HARNESS & SOME HARDWARE NOT SHOWN FOR CLARITY

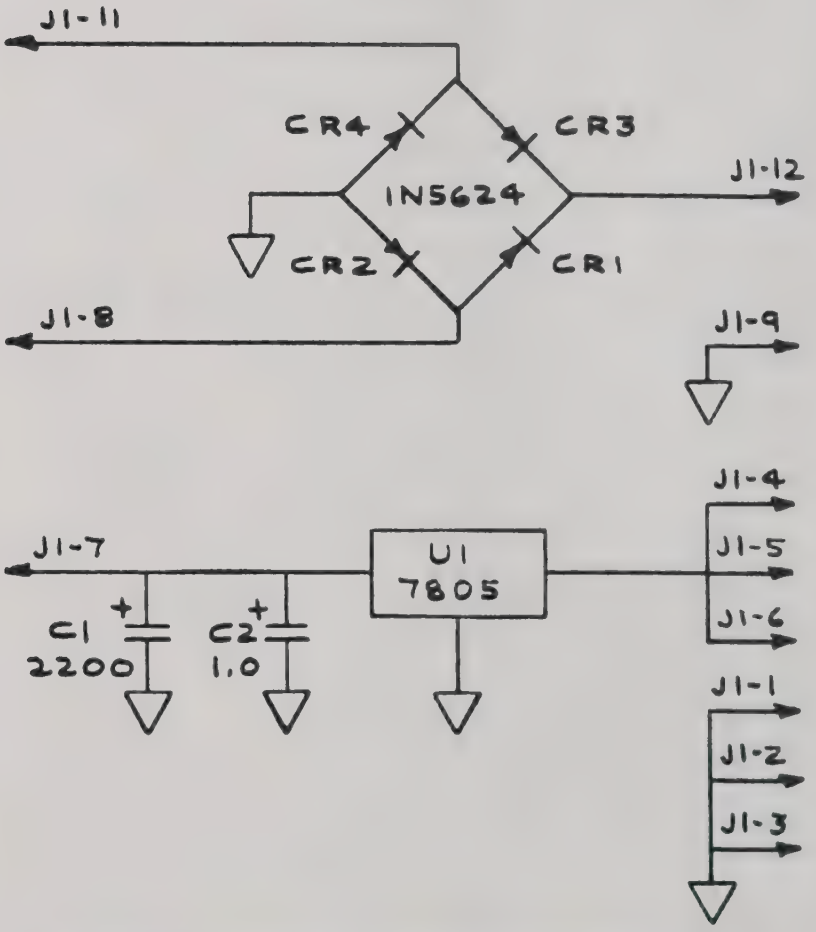
MAINFRAME ASSEMBLY DRAWING



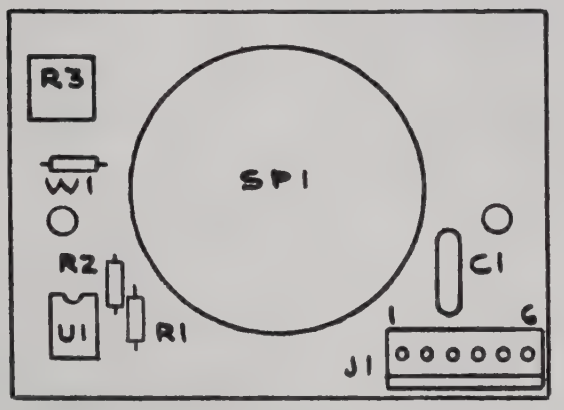
MAINFRAME SCHEMATIC DIAGRAM



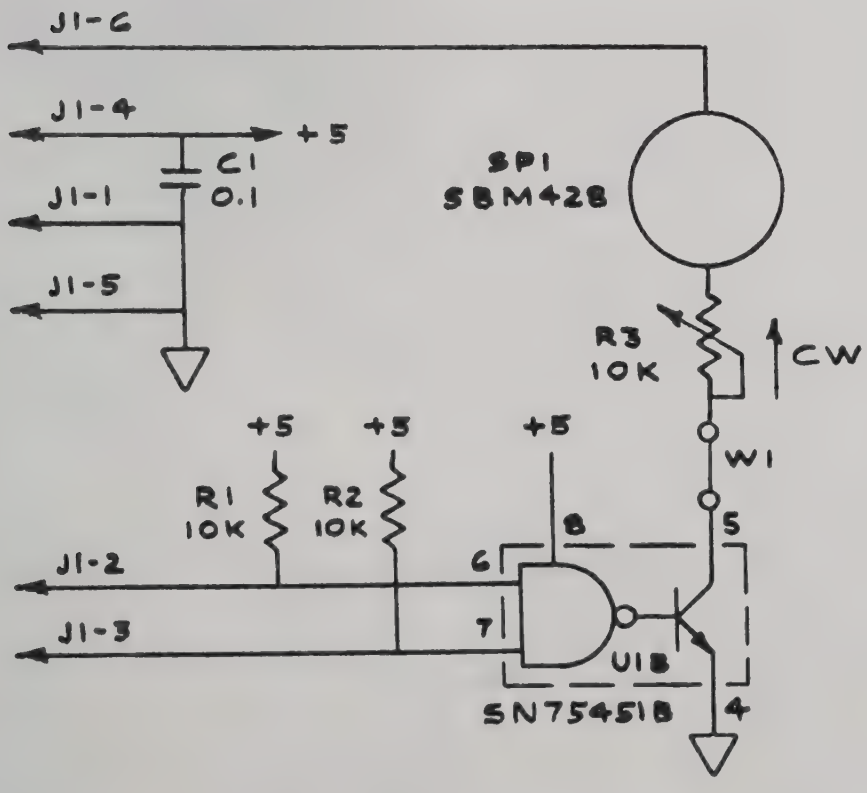
A1, POWER SUPPLY ASSEMBLY DRAWING



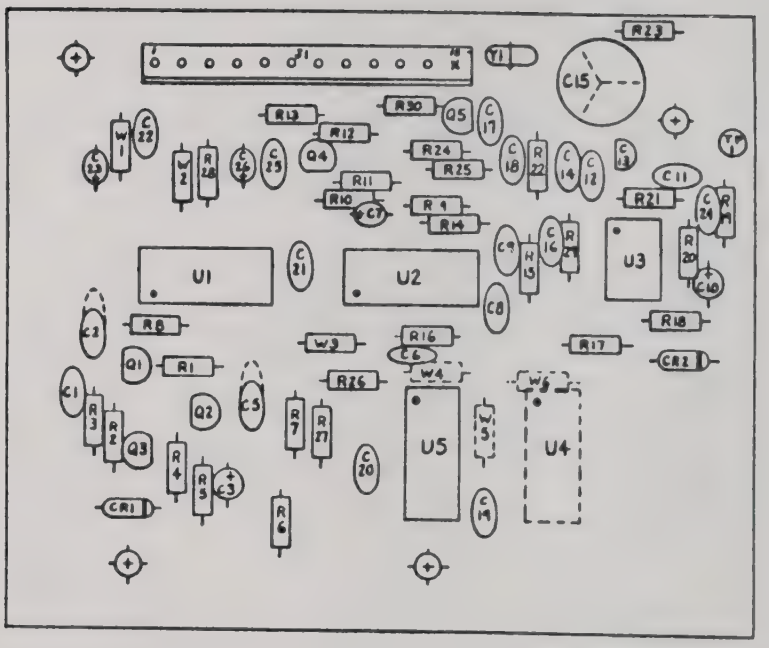
A1, POWER SUPPLY SCHEMATIC DIAGRAM



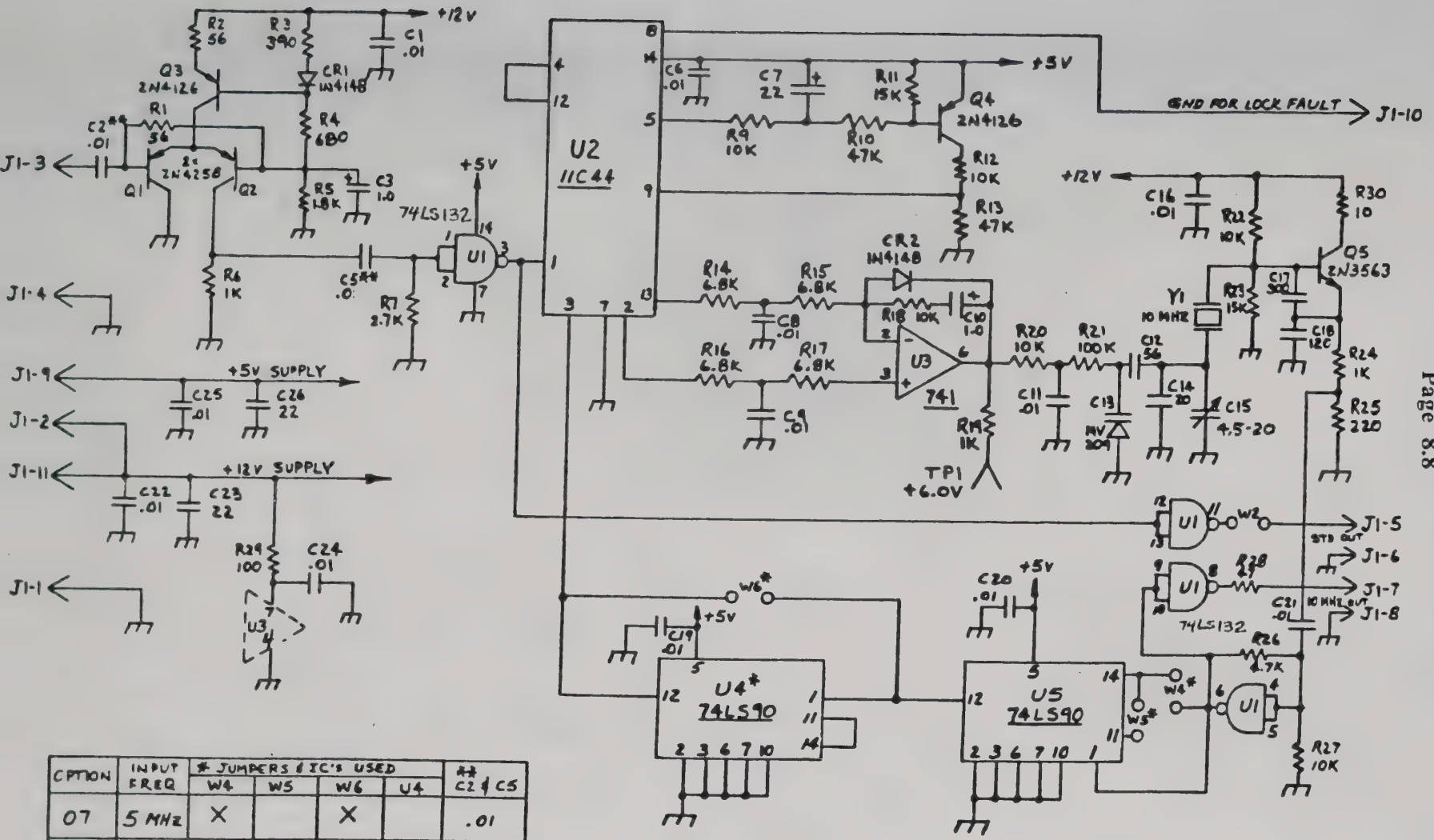
A2, AUDIBLE ALARM (OPTION 20)
ASSEMBLY DRAWING



A2, AUDIBLE ALARM (OPTION 20)
SCHEMATIC DIAGRAM

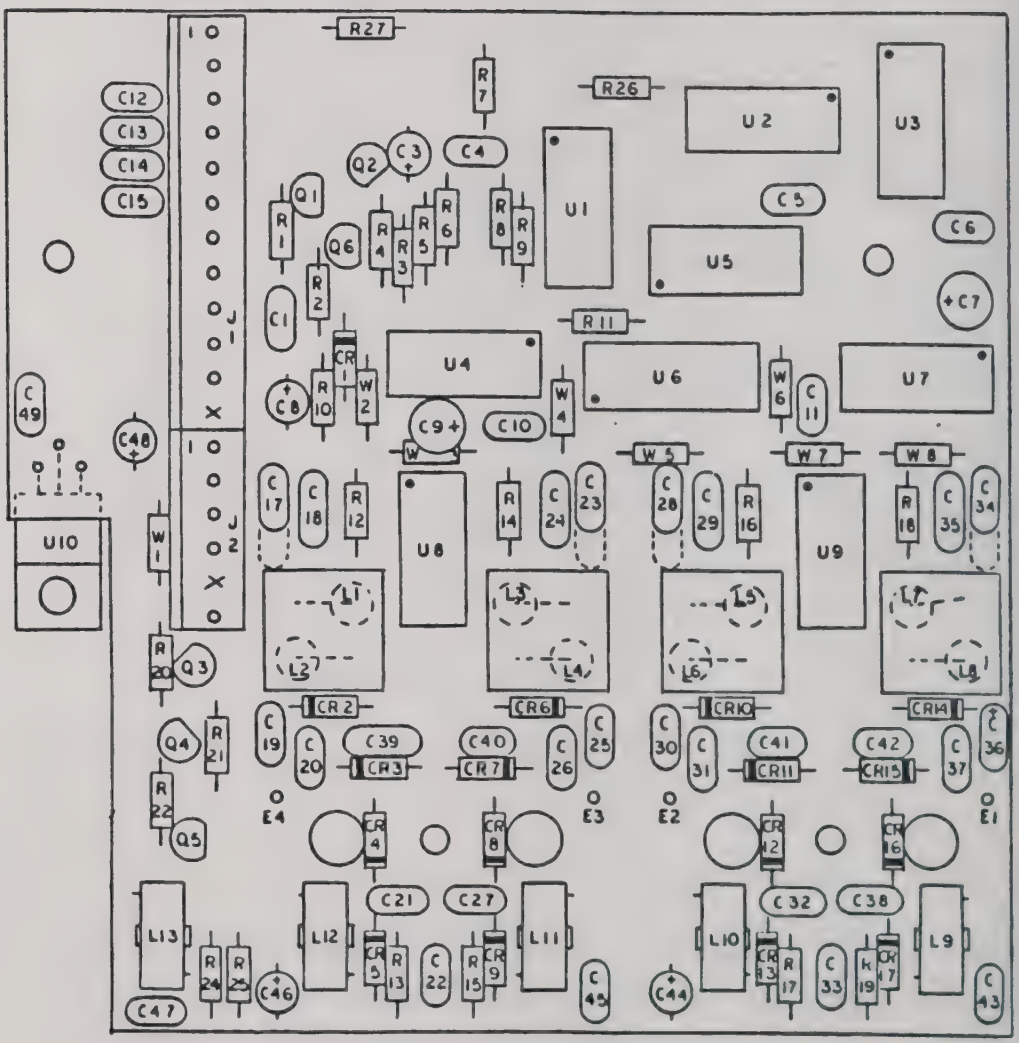


A3 INPUT TRANSLATOR (OPTION 07, 08, 12) ASSEMBLY DRAWING

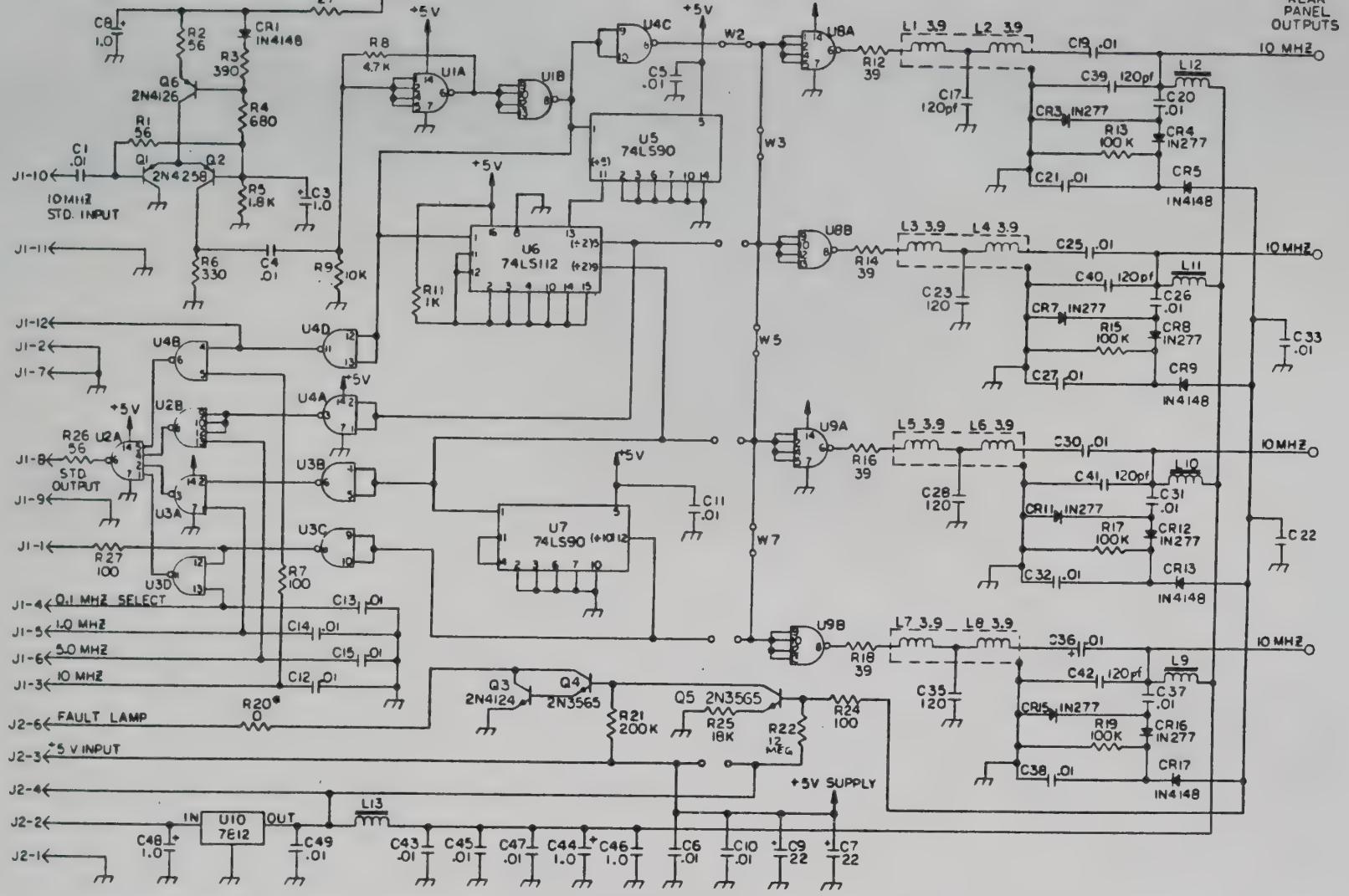


OPTION	INPUT FREQ	* JUMPERS & IC's USED				** C2 & C5
		W4	W5	W6	U4	
07	5 MHz	X		X		.01
08	1 MHz		X	X		.01
12	100 KHz		X		X	0.1

A3 INPUT TRANSLATOR (OPTION 07, 08, 12)
SCHEMATIC DIAGRAM



A4 DISTRIBUTION AMPLIFIER
ASSEMBLY DRAWING



* R20 IS 180 OHMS ON MODELS WITH SERIAL NUMBERS LESS THAN 8130-0438, 8140-0489 AND 8161-0677 EXCEPT 8140'S WITH OPTION 07 OR 08 OR 12.

A4 DISTRIBUTION AMPLIFIER SCHEMATIC DIAGRAM

PARTS

Introduction 9.2

Replaceable Parts Mainframe 9.3

Replaceable Parts A1, Power Supply ... 9.4

Replaceable Parts A2, Audible Alarm (Option 20) 9.5

Replaceable Parts A3, Input Translator (Option 07, 08, or 12) 9.6

Replacement Parts A4, Distribution Amplifier 9.8

Ancillary Kit Parts List 9.12

INTRODUCTION

The parts lists on the following pages include mainframe components, complete printed circuit board assemblies, and pc board components that are normally considered replaceable.

A parts list is also included for the ancillary kit.

REPLACEABLE PARTS – MAINFRAME

Reference Designation	Part Number	Description
C1	C00202	Capacitor, 0.01 µf, 1600 Vdc
C2	C00202	Capacitor, 0.01 µf, 1600 Vdc
C3	C00300	Capacitor, 8900 µf, 25 Vdc
DS1	DS00045	LED, green
DS2	DS00042	LED, red
F1	F00R75	Fuse, 3/4 Amp (AGC 3/4)
R1	R01181	Resistor, 180 Ω, 1/4 W
R2	R01151	Resistor, 150 Ω, 1/4 W
S1	S00001	Switch, pushbutton
S2	S00102	Switch, DPDT, slide
T1	T10000	Transformer, power

REPLACEABLE PARTS – A1 POWER SUPPLY

Reference Designation	Part Number	Description
A1	003600	Assembly, power supply, pc board
C1	C07222	Capacitor, 2200 µf, 25 Vdc
C2	C09010	Capacitor, 1 µf, 50 Vdc
CR1-CR4	CR05624	Rectifier, 3 amperes
J1	J10014	Header, 6-pin
U1	U07805	Regulator, 5 Vdc

REPLACEABLE PARTS – A2 AUDIBLE ALARM (OPTION 20)

Reference Designation	Part Number	Description
A2	004600	Assembly, Audible Alarm (Option 20), pc board
C1	C01104	Capacitor, ceramic, 0.1 µf, 25 Vdc
J1	J10014	Header, 6-pin
R1	R01103	Resistor, 10 KΩ, 1/4 W
R2	R01103	Resistor, 10 KΩ, 1/4 W
R3	R05502	Potentiometer, 5 KΩ
SP1	SP00001	Sonalert, SBM428
U1	U75451	Integrated Circuit, SN75451B

REPLACEABLE PARTS – A3 INPUT TRANSLATOR (OPTION 07, 08, OR 12)

Reference Designation	Part Number	Description
A3	004500	Assembly, Input Translator (Option 07, 08, 12), pc board
C1	C02103	Capacitor, ceramic, 0.01µf, 25 Vdc
C2	C02103	Capacitor, ceramic, 0.01µf, 25 Vdc
C2*	C01104	Capacitor, ceramic, 0.1µf, 25 Vdc
C3	C09010	Capacitor, electrolytic, 1 µf, 50 Vdc
C4	---------	Not used.
C5	C02103	Capacitor, ceramic, 0.01 µf, 25 Vdc
C5*	C01104	Capacitor, ceramic, 0.1 µf, 25 Vdc
C6	C02103	Capacitor, ceramic, 0.01 µf, 25 Vdc
C7	C07220	Capacitor, electrolytic, 22 µf, 25 Vdc
C8	C02103	Capacitor, ceramic, 0.01 µf, 25 Vdc
C9	C02103	Capacitor, ceramic, 0.01 µf, 25 Vdc
C10	C09010	Capacitor, electrolytic, 1 µf, 50 Vdc
C11	C02103	Capacitor, ceramic, 0.01 µf, 25 Vdc
C12	C05560	Capacitor, mica, 56 pf, 500 Vdc
C13	CR00209	Varicap, MV209
C14	C05200	Capacitor, mica, 20 pf, 500 Vdc
C15	C00040	Capacitor, variable, 4.5 – 20 pf
C16	C02103	Capacitor, ceramic, 0.01 µf, 25 Vdc
C17	C05301	Capacitor, mica, 300 pf, 500 Vdc
C18	C05121	Capacitor, mica, 120 pf, 500 Vdc
C19	C02103	Capacitor, ceramic, 0.01 µf, 25 Vdc
C20	C02103	Capacitor, ceramic, 0.01 µf, 25 Vdc
C21	C02103	Capacitor, ceramic, 0.01 µf, 25 Vdc
C22	C02103	Capacitor, ceramic, 0.01 µf, 25 Vdc
C23	C07220	Capacitor, electrolytic, 22 µf, 25 Vdc
C24	C02103	Capacitor, ceramic, 0.01 µf, 25 Vdc
C25	C02103	Capacitor, ceramic, 0.01 µf, 25 Vdc
C26	C07220	Capacitor, electrolytic, 22 µf, 25 Vdc

* Used with Option 12 only.

CR1	CR04148	Diode, 1N4148
CR2	CR04148	Diode, 1N4148
J1	J10014	Header, 6-pin
Q1	Q04258	Transistor, 2N4258
Q2	Q04258	Transistor, 2N4258
Q3	Q04126	Transistor, 2N4126
Q4	Q04126	Transistor, 2N4126
Q5	Q03563	Transistor, 2N3563

[MORE]

REPLACEABLE PARTS – A3 INPUT TRANSLATOR (OPTION 07, 08, OR 12) (Continued)

Reference Designation	Part Number	Description
R1	R01560	Resistor, 56 Ω, 1/4 W, 5%
R2	R01560	Resistor, 56 Ω, 1/4 W, 5%
R3	R01391	Resistor, 390 Ω, 1/4 W, 5%
R4	R01681	Resistor, 680 Ω, 1/4 W, 5%
R5	R01182	Resistor, 1.8 KΩ, 1/4 W, 5%
R6	R01102	Resistor, 1 KΩ, 1/4 W, 5%
R7	R01272	Resistor, 2.7 KΩ, 1/4 W, 5%
R8	R01472	Resistor, 4.7 KΩ, 1/4 W, 5% [Not used]
R9	R01103	Resistor, 10 KΩ, 1/4 W, 5%
R10	R01473	Resistor, 47 KΩ, 1/4 W, 5%
R11	R01153	Resistor, 15 KΩ, 1/4 W, 5%
R12	R01103	Resistor, 10 KΩ, 1/4 W, 5%
R13	R01473	Resistor, 47 KΩ, 1/4 W, 5%
R14	R01682	Resistor, 6.8 KΩ, 1/4 W, 5%
R15	R01682	Resistor, 6.8 KΩ, 1/4 W, 5%
R16	R01682	Resistor, 6.8 KΩ, 1/4 W, 5%
R17	R01682	Resistor, 6.8 KΩ, 1/4 W, 5%
R18	R01103	Resistor, 10 KΩ, 1/4 W, 5%
R19	R01102	Resistor, 1KΩ, 1/4 W, 5%
R20	R01103	Resistor, 10 KΩ, 1/4 W, 5%
R21	R01104	Resistor, 100 KΩ, 1/4 W, 5%
R22	R01103	Resistor, 10 KΩ, 1/4 W, 5%
R23	R01153	Resistor, 15 KΩ, 1/4 W, 5%
R24	R01102	Resistor, 1KΩ, 1/4 W, 5%
R25	R01221	Resistor, 220 Ω, 1/4 W, 5%
R26	R01472	Resistor, 4.7 KΩ, 1/4 W, 5%
R27	R01103	Resistor, 10 KΩ, 1/4 W, 5%
R28	R01470	Resistor, 47 Ω, 1/4 W, 5%
R29	R01101	Resistor, 100 Ω, 1/4 W, 5%
R30	R01100	Resistor, 10 Ω, 1/4 W, 5%
U1	ULS132	Integrated Circuit, 74LS132
U2	U11C44	Integrated Circuit, 11C44
U3	U00741	Integrated Circuit, µA741CP
U3	U00411	Integrated Circuit, µA411 [Alternate part]
U4	U4LS90	Integrated Circuit, 74LS90
U5	U4LS90	Integrated Circuit, 74LS90
Y1	Y00011	Crystal, 10 MHz

REPLACEABLE PARTS – A4 DISTRIBUTION AMPLIFIER

Reference Designation	Part Number	Description
A4	004400	Assembly, Distribution amplifier, pc board
C1	C02103	Capacitor, ceramic, 0.01µf, 25 Vdc
C2	---------	Not used.
C3	C09010	Capacitor, electrolytic, 1.0 µf, 35 Vdc
C4	C02103	Capacitor, ceramic, 0.01µf, 25 Vdc
C5	C02103	Capacitor, ceramic, 0.01µf, 25 Vdc
C6	C02103	Capacitor, ceramic, 0.01µf, 25 Vdc
C7	C12226	Capacitor, tantalum, 22 µf, 25 Vdc
C8	C09010	Capacitor, electrolytic, 1.0 µf, 35 Vdc
C9	C12226	Capacitor, electrolytic, 22 µf, 25 Vdc
C10	C02103	Capacitor, ceramic, 0.01µf, 25 Vdc
C11	C02103	Capacitor, ceramic, 0.01µf, 25 Vdc
C12	C02103	Capacitor, ceramic, 0.01µf, 25 Vdc
C13	C02103	Capacitor, ceramic, 0.01µf, 25 Vdc
C14	C02103	Capacitor, ceramic, 0.01µf, 25 Vdc
C15	C02103	Capacitor, ceramic, 0.01µf, 25 Vdc
C16	---------	Not used.
C17	C05121	Capacitor, mica, 120 pf, 500 Vdc
C18	---------	Not used.
C19	C02103	Capacitor, ceramic, 0.01µf, 25 Vdc
C20	C02103	Capacitor, ceramic, 0.01µf, 25 Vdc
C21	C02103	Capacitor, ceramic, 0.01µf, 25 Vdc
C22	C02103	Capacitor, ceramic, 0.01µf, 25 Vdc
C23	C05121	Capacitor, mica, 120 pf, 500 Vdc
C24	---------	Not used.
C25	C02103	Capacitor, ceramic, 0.01µf, 25 Vdc
C26	C02103	Capacitor, ceramic, 0.01µf, 25 Vdc
C27	C02103	Capacitor, ceramic, 0.01µf, 25 Vdc
C28	C05121	Capacitor, mica, 120 pf, 500 Vdc
C29	---------	Not used.
C30	C02103	Capacitor, ceramic, 0.01µf, 25 Vdc
C31	C02103	Capacitor, ceramic, 0.01µf, 25 Vdc
C32	C02103	Capacitor, ceramic, 0.01µf, 25 Vdc
C33	C02103	Capacitor, ceramic, 0.01µf, 25 Vdc
C34	---------	Not used.
C35	C05121	Capacitor, mica, 120 pf, 500 Vdc
C36	C02103	Capacitor, ceramic, 0.01µf, 25 Vdc
C37	C02103	Capacitor, ceramic, 0.01µf, 25 Vdc
C38	C02103	Capacitor, ceramic, 0.01µf, 25 Vdc
C39	C05121	Capacitor, mica, 120 pf, 500 Vdc

[MORE]

REPLACEABLE PARTS – A4 DISTRIBUTION AMPLIFIER (Continued)

Reference Designation	Part Number	Description
C40	C05121	Capacitor, mica, 120 pf, 500 Vdc
C41	C05121	Capacitor, mica, 120 pf, 500 Vdc
C42	C05121	Capacitor, mica, 120 pf, 500 Vdc
C43	C02103	Capacitor, ceramic, 0.01µf, 25 Vdc
C44	C09010	Capacitor, electrolytic, 1.0 µf, 35 Vdc
C45	C02103	Capacitor, ceramic, 0.01µf, 25 Vdc
C46	C09010	Capacitor, electrolytic, 1.0 µf, 35 Vdc
C47	C02103	Capacitor, ceramic, 0.01µf, 25 Vdc
C48	C09010	Capacitor, electrolytic, 1.0 µf, 35 Vdc
C49	C02103	Capacitor, ceramic, 0.01µf, 25 Vdc
CR1	CR04148	Diode, 1N4148
CR2	----------	Not used.
CR3	CR00277	Diode, 1N277
CR4	CR00277	Diode, 1N277
CR5	CR04148	Diode, 1N4148
CR6	----------	Not used.
CR7	CR00277	Diode, 1N277
CR8	CR00277	Diode, 1N277
CR9	CR04148	Diode, 1N4148
CR10	----------	Not used.
CR11	CR00277	Diode, 1N277
CR12	CR00277	Diode, 1N277
CR13	CR04148	Diode, 1N4148
CR14	----------	Not used.
CR15	CR00277	Diode, 1N277
CR16	CR00277	Diode, 1N277
CR17	CR04148	Diode, 1N4148
J1	J10014	Header, 6-pin
J2	J10014	Header, 6-pin (Pin 5 removed.)
L1	L023R9	Choke, RF, 3.9 µH
L2	L023R9	Choke, RF, 3.9 µH
L3	L023R9	Choke, RF, 3.9 µH
L4	L023R9	Choke, RF, 3.9 µH
L5	L023R9	Choke, RF, 3.9 µH
L6	L023R9	Choke, RF, 3.9 µH
L7	L023R9	Choke, RF, 3.9 µH
L8	L023R9	Choke, RF, 3.9 µH

[MORE]

REPLACEABLE PARTS – A4 DISTRIBUTION AMPLIFIER (Continued)

Reference Designation	Part Number	Description
L9	L04000	Inductor, toroidal
L10	L04000	Inductor, toroidal
L11	L04000	Inductor, toroidal
L12	L04000	Inductor, toroidal
L13	L04000	Inductor, toroidal
Q1	Q04258	Transistor, 2N4258
Q2	Q04258	Transistor, 2N4258
Q3	Q04124	Transistor, 2N4124
Q4	Q03565	Transistor, 2N3565
Q5	Q03565	Transistor, 2N3565
Q6	Q04126	Transistor, 2N4126
R1	R01560	Resistor, 56 Ω, 1/4 W, 5%
R2	R01560	Resistor, 56 Ω, 1/4 W, 5%
R3	R01391	Resistor, 390 Ω, 1/4 W, 5%
R4	R01681	Resistor, 680 Ω, 1/4 W, 5%
R5	R01182	Resistor, 1.8 KΩ, 1/4 W, 5%
R6	R01331	Resistor, 330 Ω, 1/4 W, 5%
R7	R01101	Resistor, 100 Ω, 1/4 W, 5%
R8	R01472	Resistor, 4.7 KΩ, 1/4 W, 5%
R9	R01103	Resistor, 10 KΩ, 1/4 W, 5%
R10	R01270	Resistor, 27 Ω, 1/4 W, 5%
R11	R01102	Resistor, 1 KΩ, 1/4 W, 5%
R12	R01390	Resistor, 39 Ω, 1/4 W, 5%
R13	R01104	Resistor, 100 KΩ, 1/4 W, 5%
R14	R01390	Resistor, 39 Ω, 1/4 W, 5%
R15	R01104	Resistor, 100 KΩ, 1/4 W, 5%
R16	R01390	Resistor, 39 Ω, 1/4 W, 5%
R17	R01104	Resistor, 100 KΩ, 1/4 W, 5%
R18	R01390	Resistor, 39 Ω, 1/4 W, 5%
R19	R01104	Resistor, 100 KΩ, 1/4 W, 5%
R20	R01000	Resistor, 0 Ω
R21	R01224	Resistor, 220 KΩ, 1/4 W, 5%
R22	R01126	Resistor, 12 MΩ, 1/4 W, 5%
R23	---------	Not used.
R24	R01101	Resistor, 100 Ω, 1/4 W, 5%
R25	R01183	Resistor, 18 KΩ, 1/4 W, 5%
R26	R01560	Resistor, 56 Ω, 1/4 W, 5%
R27	R01101	Resistor, 100 Ω, 1/4 W, 5%

[MORE]

REPLACEABLE PARTS – A4 DISTRIBUTION AMPLIFIER (Continued)

Reference Designation	Part Number	Description
U1	U4LS20	Integrated Circuit, SN74LS20
U2	U4S140	Integrated Circuit, SN74S140N
U3	U4LS37	Integrated Circuit, SN74LS37
U4	U4LS37	Integrated Circuit, SN74LS37
U5	U4LS90	Integrated Circuit, SN74LS90
U6	ULS112	Integrated Circuit, SN74LS112N
U7	U4LS90	Integrated Circuit, SN74LS90
U8	U4S140	Integrated Circuit, SN74S140N
U9	U4S140	Integrated Circuit, SN74S140N
U10	U78T12	Voltage Regulator, 78T12ACT

ANCILLARY KIT PARTS LIST

Part Number	Description
F00R75	Fuse, 3/4 Ampere
004490	Termination, 50 Ω, DC-isolated
P00002	Plug, BNC
W01000	Cord, ac power

THE FOLLOWING IS A LIST OF MANUAL REVISIONS

A resistive circuit protector has been installed in Model 8140s, Serial Numbers 0816 and above (0817, 0818, 0819 excluded) to protect the distribution power supply from overload damage. Manual page revisions are as follows:

PAGE	REVISION
8.10	Replace L13 with resistor symbol,
9.10	Change L13 part number to FCP1R3, and description to circuit protector, 1.3A.

MP MASTER
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